REMARKS

Figures 2 and 9 have been corrected and a replacement copy has been provided. Remaining Figures 1 and 3-8 are unchanged and copies pursuant under 37 CFR 1.121(d) have been provided. Claims 1-7, and 9-20 remain in this application. Claims 1-3, 5, 6, 10-12 and 16-18 have been amended. Claim 8 has been cancelled. Claim 21 has been added.

Drawing Objection Under 37 CFR 1.84(p)(4)

The objection of the drawings has been addressed. Figure 2 has been replaced with a Replacement Figure 2 that correctly designates the graphic of a personal computer with the abbreviation "PC" or personal computer as reference "80," a personal computer. Replacement Figure 2 also now correctly depicts the "small diffraction limited spot" described on page 8, lines 25-27 in the specification as reference "52". Finally, Replacement Figure 2 no longer shows reference "17," which is described, but not specially referenced in the specification.

Figure 9 has been replaced with a new Replacement Figure 9 showing reference "80" as correctly designating the personal computer and not the laser-scan unit. Replacement Figure 9 has been corrected to reference the "laser-scan unit," described in the specification on page 13, lines 26-27, as a new reference "90" instead of reference "80," which as examiner correctly pointed out already references a "personal computer. The specification on page 13, lines 26-27 has also been amended to correctly reference a "laser-scan unit" as reference "90". Replacement Figure 9 also now correctly depicts the "small diffraction limited spot" described on page 8, lines 25-27 in the specification as reference "52". Finally, Replacement Figure 9 no longer shows reference "17," which is described, but not specially referenced in the specification. All changes are fully supported by Applicant's original disclosure.

Claim Rejections Under 35 U.S.C. § 102

The rejection of claims 1, 2, 4, 6, 7, 9, 10, and 13-17 under 35 U.S.C. 102(b) as being anticipated by Ellingson, U.S. Patent 5,689,332, (Ellingson '332) as contended by the Examiner has been addressed.

Applicant asserts that the invention as disclosed in Applicant's amended Claim 1 is patently distinct from Ellingson '332. Applicant's amended Claim 1 is now directed to a method whereby the illuminations create diffraction limited focal points. The light intensity emanating the diffraction limited focal point within the sample is measured, multiplied by a factor compensating for attenuation of light within the sample material, and compared with the measurements of another three-dimensional point. This change is fully supported by Applicant's Original Disclosure. Ellingson '332 fails to teach or even suggest the limitations of creating a first and second diffraction limited focal point or the limitation of measuring the light intensity emanating from the first and second diffraction limited focal points. In fact, Ellingson '332 teaches the use of two detectors detecting cross-polarized back-scattered light from all subsurface depths under the two-dimensional focal spot on the sample. Ellingson '332 column 4 lines 59-62.

Furthermore, amended Claim 1 now has a limitation requiring multiplying the measured light intensity by a factor to account for attenuation of light within the sample which is not taught or even suggested by Ellingson '332. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP 2131 citing, Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Finally, Ellingson '332 fails to teach or even

suggest creating a focal point within the sample. Since Ellingson '332 fails to teach all the limitations of Applicant's amended Claim 1, amended Claim 1 is unanticipated by Ellingson '332.

Claims 2, 4, 6, 7, and 9 are all in allowable form because they depend on Claim 1, which has been amended to place it in allowable form and should therefore be allowed.

Claim 10 has been amended to better reflect the patentable distinctions between Applicant's invention and Ellingson '332. Applicant's amended Claim 10 is now directed to a device having a "means to deflect said initial beam creating a diffraction limiting focal point within said sample mounted on the stage." Furthermore, Claim 10 adds a "means to compensate the measured emanating light intensity for attenuation of light within said sample."

Claim 10 is unanticipated for the similar reasoning as discussed for amended Claim 1 above. Furthermore, Ellingson '332 fails to teach or even suggest a device having a means to deflect said initial beam creating a diffraction limiting focal point within said sample mounted on the stage or a means to measure the emanating light intensity emanating directly from the diffraction limiting focal point. Ellingson '332 also fails to teach or suggest a means to compensate the measured emanating light intensity for attenuation of light within the sample material. Finally, Ellingson '332 fails to teach or even suggest creating a focal point within the sample. Since Ellingson '332 fails to teach all the limitations of Applicants' amended Claim 10, Applicants assert that Claim 10 is unanticipated by Ellingson '332.

Claims 13-17 are in allowable form because they depend on Claim 10, which has been amended to place it in allowable form and should therefore be allowed.

Claim Rejections Under 35 U.S.C. § 103

The rejection of claims 3, 5, 11, 12, and 18-20 under 35 U.S.C. 103(a) as being unpatentable over Ellingson U.S. Patent No. 5,689,332, (Ellingson '332) in view of Ellingson U.S. Patent 6,285,449 (Ellingson '449) and Haga (5,745,236) as contended by the Examiner have been addressed.

Ellingson '332 and Ellingson '449 teach two-dimensional Optical Scatter systems that are able to detect and display surface defects in a ceramic body across a two-dimensional plane. The laser source produces light that is directly reflected off a polarization beam splitter (PBS), through a focusing lens and focused onto the surface of a sample. This focusing lens is provided to focus light from the laser onto the surface of the sample. See Ellingson '332 col 3, lines 56-65 and Ellingson '449 col. 4 lines 36-41. The system does not need to be aligned, and only requires the laser light to be focused on the sample of the surface. Light reflected directly off the surface of the sample is reflected back towards the laser via the PBS. Light that has passed through the subsurface at any depth of the sample passes through the PBS to a detector as in Ellingson '449 or series of detectors as in Ellingson '332. The specimen is then moved in x and y directions. The data from the detector (Ellingson '449) or detectors (Ellingson '332) is then used to construct a two-dimensional grayscale image, or to help determine the width of a crack as suggested by Ellingson '332. Ellingson '449 suggests using optical fiber as a flexible source to allow easier movement of the laser from the rest of the apparatus.

Haga relates to an optical imaging apparatus for two-dimensional viewing of a surface of identification cards. Haga uses a halogen light source whereby the light is transferred through an optical fiber and an aperture. The aperture creates a point-like source. Light from the aperture is passed through an expanding lens which broadens the beam of light. The light from

the lens is then reflected off a half mirror onto the surface of a sample. Light from the halogen light source is also diverted to create auxiliary light sources which illuminate the sides of the sample. The light reflected off the surface of the sample as well as subsurface light is reflected back through the half mirror through a focusing lens onto a CCD. It is important to note that although subsurface light is reflected off the sample, it is very weak compared with the light incident on the surface. See Applicant's Original Specification pg. 2 lines 8-9.

Examiner states that it would have been obvious to one of ordinary skill in the art to combine Ellingson '332 in view of Ellingson '449 and Haga to arrive at the invention disclosed in Applicant's claims 3, 5, 11, 12, and 18-20. Applicant respectfully disagrees.

Amended Claim 1

Applicant respectfully disagrees with Examiner's assertion that it would be obvious to combine the cited references (Ellingson '449 and '332 and Haga) to arrive at the invention as taught by Applicant's claim 1. Furthermore, even if such references were combined such a combination still fails to teach Applicant's invention.

Applicant asserts that it would be unboviuos to combine the optical fiber in Ellingson '449 with a point like source in Haga to arrive at Applicat's claim 1, as asserted by Examiner. While Ellingson '449 suggests using an optical fiber in a 2-D system as an easy way to move the light it fails to teach or even suggest the use of the optical fiber to create a point like source to create a 3-D system taught by Applicant. If it was obvious to combine the optical fiber of a 2-D system like Ellingson's with Haga's to create a previously unknown 3-D system as taught by Applicant one would expect that Ellingson would at least suggested such a possibility. The mere fact that the prior art may be modified in a manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.

MPEP 2143.01 citing In re Fritch, 972 F. 2d 1260 at 1266 (1992) Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination. ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F. 2d 1572 at 1577 (1984). Since neither reference cited by Examiner teaches or even suggest the combination asserted by Examiner, Applicant respectfully suggest that such a combination is unobvious, especially given the fact that the cited references relate to 2-D systems.

Even if Ellingson '332 and Ellingson '449, and Haga were combined, they still fail to teach all of the limitation of Applicant's amended claim 1. Amended claim 1 is directed to a method whereby a first illumination of a sample with polarized light creates a diffraction limited focal point within the sample. The light intensity emanating from the diffraction limited focal point having been polarized in a different direction than the first illumination is then measured. The sample is then repositioned to take another measurement using the same method. The measurements are then multiplied by a factor compensating for attenuation in the sample.

None of the cited reference teach individually or in combination, the illumination of a sample with polarized light to create a diffraction limited focal point within the sample as taught by Applicant. In fact, Ellingson '332, Ellingson '449 and Haga all teach away from Applicant's invention by teaching the focusing or expanding of a light onto the surface of the sample. See Ellingson '449 col. 4 lines 36-41 and Ellingson '332 col. 2 lines 50-52. It is error to find obviousness where references 'diverge from and teach away from the invention at hand. Fine at 1075. The importance of creating a diffraction limited focal point within the sample is evident from Applicant's disclosure. The failure of any of the cited references to teach such a limitation should illustrates the patentability and unobviousness of Applicant's invention.

Furthermore, the combination of Ellingson '332, Ellingson '449, and Haga does not teach or even suggest a method to measure the light emanating from a diffraction limited focal point. Ellingson '332 and '449 detects light from the entire illuminated subsurface, and light from the surrounding area of the sample. Likewise, Haga detects the entire illuminated sample. Again, the references are teaching away from Applicant's invention.

It should be noted that amended Claim 1 now incorporates the limitation of original Claim 8. The combination of Ellingson '332, Ellingson '449, and Haga does not teach or suggest compensation for the attenuation of light in the sample. Ellingson '332 and Ellingson '449 teach subsurface detection, but make no mention of attenuation of light within the surface. The combination of Ellingson '332, Ellingson '449, and Haga does not teach or suggest Applicant's invention. Examiner has asserted that attenuation correction is obvious in light of Ellingson '332 in view of Guy. Applicant respectfully disagrees with this assertion.

Applicants assert that combination of Ellingson and Guy, as suggested by Examiner is unobvious. The mere fact that the prior art may be modified in a manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. MPEP 2143.01. Neither reference teaches or even suggests such a combination. Furthermore, it would be unobvious for one in the art of surface detection like Ellingson to look to a theatrical missile detection system as taught by Guy to solve a problem of attenuation.

In addition, the measured intensity in Ellingson '332 is the intensity of emanating gross backscattered light appearing on the sample's surface, and this emanating light travels in air before measured by detectors. Because air (and the optics in the detection train) does not cause attenuation, no attenuation needs (or can be) compensated for in Ellingson. Therefore, it

would be unobvious to use the compensation factor in Guy to overcome a problem not found, discussed, taught or even alluded to in Ellingson.

Even if Ellingson '332 and Guy were combined they would not produce the invention as claimed by Applicant. The compensation factor in Guy is a fixed value ($\cos^2$ alpha) – Eq. 6 in Guy, where alpha is an angle. In the current invention, a variable compensating factor in exponential form is used, exp(2 (alpha) z). See Applicant's Original Specification page 12, line 27. Where alpha is the linear attenuation coefficient of the sample's material and z is the depth of the three-dimensional spot relative to sample's surface. Although the coefficient alpha is a constant, the depth z is a variable within a cross-sectional scan image, and must be calculated for each position (or pixel) in the scan image. Therefore, it is clear that a constant compensating factor in Guy can not be directly applied in the current invention in which automated calculation process is performed to determine the depth z in every pixel of a cross-sectional scan image in order to apply the variable compensating factor exp(2 (alpha) z). For the foregoing reasons, amended Claim 1 is not obvious in light of Ellingson '332, Ellingson '449, Haga, or Guy and therefore amended Claim 1 should be allowed.

Amended Claim 3

Amended Claim 3 depends on amended Claim 1, and distinguishes over Ellingson '332, Ellingson '449 and Haga for at least the same or similar reasons recited above for Claim 1. As stated above, Applicants' assert that it would be unobvious to combine Ellingson '332, '449 and Haga.

Applicant's amended Claim 3 teaches that the first and second illumination is constricted to emanate from a polarization-maintaining optical fiber creating a point source of between 1 and 10 microns.

None of the cited references individually or in combination teach or even suggest using a very thin optical fiber between 1-10 microns to create a point source. The importance of the optical fiber's diameter is evident from Applicant's Original Specification and amended Claim 3. See Applicant's Original Specification pg. 6 line 32 through pg 7, line 7. MPEP 2143.03 provides "To establish prima facia obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka 490 F.2d 981 (1974).

Second, Ellingson '332, Ellingson '449 and Haga do not teach or even suggest a diffraction limited focal point within the sample. Haga teaches to expand the light emitting from the halogen light source onto the surface of the sample. Contrarily, Applicant teaches to narrow the light into a diffraction limited focal point.

Amended Claim 5

Claim 5 depends on amended Claim 1 and 3, and distinguishes over Ellingson '332, Ellingson '449 and Haga for at least for the same reasons recited above for Claims 1 and 3. As stated above, Applicants' assert that it would be unobvious to combine Ellingson '332, '449 and Haga

Applicant's amended Claim 5 teaches that the illuminating light is passed through first an expanding lens, then a polarized beam splitter, and finally through a focusing lens creating the first and second diffraction limited focal point directed toward the sample. None of the cited references teach a method with such limitations. Combining the references would be unobvious for lack of motivation or suggestion for the combination and the fact that the lens used in the cited references are used differently than used by Applicant.

Amended Claim 10

Amended Claim 10 describes the apparatus of Applicant's invention and has been amended to more distinctly point out Applicant's invention. Claim 10 is allowable for similar reasoning as described for Claim 1. As stated above, Applicants' assert that it would be unobvious to combine Ellingson '332, '449 and Haga for similar reasons as discussed above.

Even if Ellingson '332 and Ellingson '449 could be combined with Haga, not all of the limitations in Claim 10 are present in the combination of Ellingson '332, Ellingson '449 and Haga. For example, Ellingson '332, Ellingson '449 and Haga do not teach or even suggest illuminating within the sample Ellingson '332, Ellingson '449, and Haga all illuminate the surface of the sample); fail to teach or even suggest use of a diffraction limited focal point or the exclusion of light not emitted from the diffraction limited focal point. Applicant teaches a confocal device requiring an alignment whereby only light from the diffraction limited focal point is received by the detector.

Additionally, Ellingson '332, Ellingson '449, and Haga fail to teach multiplying the measurements from the detector by a factor to compensate for attenuation within the sample. Ellingson '332, Ellingson '449 and Haga do not teach or suggest compensation for attenuation in the sample. As described above for Claim 1, neither does Guy teach or even suggest compensation for attenuation of light within a sample. Accounting for attenuation within the sample is important for three-dimensional imaging as taught by Applicant. For the forgoing reasons Claim 10 is allowable over Ellingson '332 and Ellingson '449 in view of Haga and Guy.

Ellingson '332 and Ellingson '449 use light directly from the light source. Haga does not focus the light, but expands the light onto the surface.

Amended Claim 11

Applicant respectfully disagrees with Examiners assertion that Claim 11 is obvious in light of Ellingson '449, and view of Ellingson '332 and Haga. Claim 11 is unobvious for the similar reasoning as described above for Claim 3. Since, Claim 11 depends on amended Claim 10, it also distinguishes over Ellingson '332, Ellingson '449 and Haga for the reasons recited above for Claim 10.

Amended Claim 12

Applicant has amended Claim 12 and submits that that Claim 12 is unobvious in light of Ellingson '449, and view of Ellingson '332 and Haga for similar reasons as discussed above. Since, Claim 12 depends on amended Claim 10, it is also believed to distinguish over Ellingson '332, Ellingson '449 and Haga for the reasons recited above for Claim 10.

Even if Ellingson '332, Ellingson '449 and Haga were combined, all the limitations taught under Applicant's Claim 12 are not taught or even suggested by the references. All claim limitations must be taught or suggested by the prior art. See In re Royka 490 F.2d 981 (1974). The combination of Ellingson '332, Ellingson '449 and Haga does not teach or even suggest a focusing lens which focuses light below the surface of the sample. In fact, the reference teach against Applicant's invention by teaching to focus the light on the surface of the sample.

Amended Claim 18

Claim 18 describes the apparatus of Applicant's invention and has been amended to more distinctly point out Applicant's invention. Claim 18 now correctly points out: the very thin (1-10 micron) optical fiber, a focusing lens for focusing light into a focal point below the surface of the sample, and accounting for attenuation within the sample. Applicant maintains it would be unobvious to combine the references for similar reasoning as discussed above.

Even if Ellingson '332, Ellingson '449 and Haga were combined, none of the cited references individually or in combination, teach or even suggest an apparatus comprising: a laser producing a beam of light polarized in a first polarization direction; an optical fiber transmitting said beam while maintaining said first polarization direction such that said beam exits from said fiber as from a point like source; wherein the diameter of the fiber is between 1-10 microns; a first lens expanding said beam; a polarized beam splitter deflecting said beam toward a sample; a second lens focusing said deflected beam creating diffraction limited point below the surface of the sample; a stage supporting said sample, said stage movable and orientable in one or more directions so as to vary positions and orientations of the sample relative to the deflected beam, said sample so mounted on said stage in a first stage position and orientation that light scattered from said sample is directed toward said second lens; said second lens collecting said scattered light and directing said scattered light toward the polarized beam splitter; said polarized beam splitter adapted so as to transmit only a portion of the scattered light that is polarized in a second direction of polarization distinct from said first direction of polarization; a third lens focusing said transmitted light through a diffraction limited pinhole onto a detector assembly adapted to measure the light transmitted from the diffraction limited point as a function of said stage motion and orientation; whereby the measurement is multiplied by a factor compensating for attenuation of light in the sample, wherein said laser, optical fiber, first lens, polarized beam splitter, second lens, stage, third lens, pinhole, and detector assembly are held in a fixed relation with respect to each other. The following principle of law applied to all Section 103 rejections. MPEP 2143.03 provides "To establish prima facia obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka 490 F.2d 981 (1974). All words in a claim must be considered in judging

the patentability of that claim against the prior art. In re Wilson 424 F.2d 1382. That is to have any expectation of rejecting the claims over a singled reference or a combination of references, each limitation must be taught somewhere in the applied art. If the limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not teach all limitations of Claim 18.

Original Claims 19 and 20

Claims 19 and 20 depend on amended Claim 18, and therefore distinguish over Ellingson '332, Ellingson '449 and Haga for the reasons recited above for Claim 18.

Claim 8

Claim 8 has been canceled. The limitations of claim 8 have been incorporated into Claims 1, 10 and 18.

Claim 21

Claim 21 is supported by the disclosure in Applicant's Original Specification on page 8, lines 2-5. This new claim points out the three-dimensional raster measurements that are used to construct a 3D image that are not taught or even suggested in Ellingson '332, Ellingson '449, Guy, or Haga. The cited references relate to 2-D systems, and none of them teach the creation of 3-D images as taught by Applicant.

CONCLUSION

For the forgoing reasons, Applicant respectfully requests that the Examiner allow Original claims 4, 7, 9, 13-15 and 19-20; Amended claims 1-3, 5, 6, 10-12 and 16-18; and newly presented claim 21 as indicated on the attached complete listing of claims.

Respectfully submitted,

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